NORTH-EX PUBLIC SCHOOL (Session 2020-21)
Class – X
Subject – Science (Physics)
Unit/Chapter – 12
Topic – OHM'S LAW
Worksheet No – 04

*Note- Before attempting the question and answers you must check the links given below which will help you understand the chapter thoroughly.
You can download the worksheets or if you do not have facility to get printout then you can ask your ward to copy the worksheet in a simple notebook and must do question answers in the notebook.
Link-https://youtu.be/Cc2B6aSEurk

NOTES

Resistors

The symbol for a resistor is a device which provides opposition the flow of electric current in a circuit.
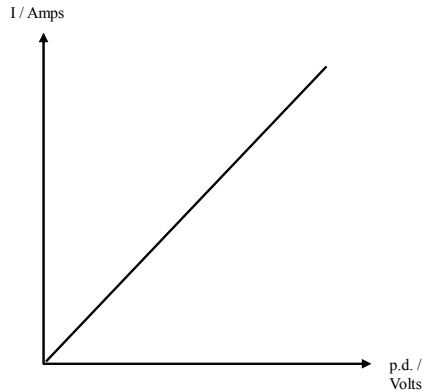
What is the relationship between current and voltage in a resistor?

Current is measured using

Voltage is measured using

Investigation: relationship between current and voltage in a resistor.

Relationship between current and voltage in a resistor

I / Amps

p.d. / Volts

Straight line through the origin tells us that current is

directly proportional to voltage

The ratio V/I is constant and is equal to resistance in the circuit.

Relationship between current and voltage in a resistor

$$\frac{V}{I} \text{ is approximately constant}$$

Relationship between current and voltage in a resistor

Ohm's Law

$$R \quad \frac{V}{I}$$

Ohm's Law : Potential difference across the two points of a metallic conductor is directly proportional to current passing through the circuit provided that temperature remains constant.
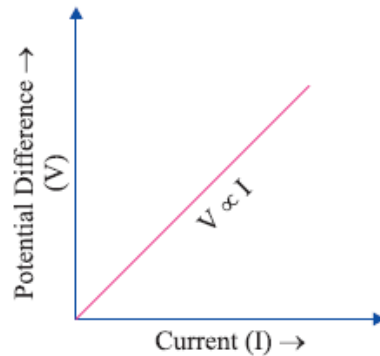
- Mathematical expression for Ohm's law :

$$V \propto I$$

$$V = IR$$

R is a constant called resistance for a given metal.

- V-I graph for Ohm's law :

Resistance (R) : It is the property of a conductor to resist the flow of charges through it.

- Ohm (Ω) : S. I. unit of resistance.

- $1 \text{ ohm} = \dfrac{1 \text{ volt}}{1 \text{ ampere}}$ *When potential difference is 1 V and current through the circuit is 1 A, then resistance is 1 ohm.*

Rheostat : Variable resistance is a component used to regulate current without changing the source of voltage.

Factors on which the Resistance of a Conductor depends :

Resistance of a uniform metallic conductor is

(i) directly proportional to the length of conductor,

(ii) inversely proportional to the area of cross-section,

(iii) directly proportional to the temperature and

(iv) depend on nature of material.

Resistivity (ρ) : It is defined as the resistance offered by a cube of a material of side 1 m when current flows perpendicular to its opposite faces.

- Its S.I. unit is ohm-metre (Ωm).
- Resistivity does not change with change in length or area of cross-section but it changes with change in temperature.
- Range of resistivity of metals and alloys is 10^{-8} to 10^{-6} Ωm.
- Range of resistivity of insulators is 10^{12} to 10^{17} Ωm.
- Resistivity of alloy is generally higher than that of its constituent metals.
- Alloys do not oxidize (burn) readily at high temperature, so they are commonly used in electrical heating devices.
- Copper and aluminium are used for electrical transmission lines as they have low resistivity.

Worksheet

1. Let the resistance of an electrical component remain constant while the potential difference across the two ends of this component decreases to half of its former value. What change will occur in the current flowing through it?
2. Two wires of equal length, one of copper and the other of manganin (an alloy) have the same thickness. Which one can be used for
   (i)   Electrical transmission lines
   (ii)   Electrical heating devices? Why?
3. A current of 5 A is flowing through a resistor of 15 Ω. Calculate the potential difference between the ends of the resistor.
4. A wire carries a current of 0.1 A and has a resistance of 120 milliohm per metre. What is the potential difference across 1 m of this wire?
5. An electric iron draws a current of 4 A from 220 V supply line. When voltage of the supply is changed, then iron draws a current of 2 A, what is the new voltage applied?
6. A potential difference of 40 V is applied across a resistance of 8 Ω for a period of 2 minutes
   (i)   What current is drawn?
   (ii)   Calculate the charge which passes through the resistor.